

JANUARY 8th, 1945.

TO THE JOINT BOARD,
INTER COUNTY RIVER IMPROVEMENT COMMISSION,
KING AND PIERCE COUNTIES, WASHINGTON.

GENTLEMEN:

Your engineers have prepared and hereby submit for your approval the annual report of work accomplished on the Puyallup, Stuck and White Rivers during the year 1944.

This review of the past years operation is closely related to work performed on the project since its inception in 1913, and to give you a brief and complete review of the immediate requirements, it is necessary to frequently refer to work performed during the past thirty years and to the results attained through these efforts; we therefore direct your attention to the following pages.

Respectfully submitted,



F. H. Essig, Chief Engineer



R. H. Thomson, Consulting Engineer

HISTORICAL REVIEW OF INTER COUNTY RIVER IMPROVEMENT

BY

R. E. THOMSON, CONSULTING ENGINEER

JANUARY 1945

The Inter County River Improvement Commission was created by an Act of the Legislature at its 1913 Session, and was formally constituted January 19th, 1914. The final act of constitution was a formal agreement that the payment for the necessary work to be done should be on a 60/40 ratio, 60% payment by King County and 40% by Pierce County. The Commission should consist of the County Commissioners of King and Pierce Counties under whom work was to be done as determined by the action of the joint board.

The necessity of the existence of such a commission resulted from the behavior of White River during the flood of November 13 - 16, 1906. At this date drift carried by the White choked its narrow and crooked channels in the curves through which for ages it had been pouring over into the Green, and for this reason quite a lake had been created in the White above its dam, this lake rising quite high, broke over the dam with such a current force that it carried the dam out and scoured the channel to a considerable depth, also cutting out a new channel to the West, producing a grade of 41 feet per mile for one and three-quarter miles when it curved to the south, here because of the slope of the ground in a distance of about one and a quarter miles the grade was reduced to four feet per mile; On this flattened grade the velocity of the current was checked and because of the loss of velocity a great deposit of rock and drift-wood was formed causing the floodwaters to flow to the right and to the left so as to dig out the earth from over 1,000 acres of land.

This material was carried down stream by the force of the flood, a considerable part of it being spread out over the valley lands to the right and left down to the City limits of Tacoma, filling a large valley area above Sumner with depths of sand and gravel along the new channel varying from five feet near the new channel to less than a foot some distance back from the channel.

Trouble did not cease here, the flood tore the banks of the Puyallup River and carried silt and drift down onto the Tacoma tidelands.

In its course along the Puyallup it tore out the brush and grass that had grown on the banks of the river, leaving the banks described as raw.

From earliest times the White at a point about two and half miles above the mouth of the canyon, had divided on some drift accumulation and a small channel of about 20% of the stream continued down hugging close under the south bank, cutting a narrow and deep channel;

In this channel it passed on below the point at which the larger channel turned to the North in toward Green River and about one and three quarter miles below that point it turned to the south and presently turned toward the west when it spread out over an old swamp of some 500 acres and dividing into small streams flowed around the banks into the swamp, finally leaving the swamp area in a number of streams which tended to slowly combine into one stream which continued along to a point some distance below Sumner where it joined the Puyallup River.

This small branch and the swamp it entered was known by the Indians as "Stuck River and Stuck Swamp".

The Puyallup Valley was greatly damaged by the overflow deposit of sand and gravel and the river banks greatly injured by the tearing out of the long grown roots of vegetation that had protected its banks from erosion.

Many persons in Pierce County were of the opinion that some act of the King County Commissioners had opened the door to this flood. As a result suits were instituted against the King County Commissioners.

State Senator Paulhamus while urging the suits did not await their conclusions, but in the 1907 session of the State Legislature asked state aid. This state aid was something that should granted, had been stated in a very full report previously submitted by General H. M. Chittenden.

As a result the Legislature approved a grant in amount of \$50,000, and authorized the Governor to appoint a Commission with authority to disburse the same; This Commission consisted of W. H. Paulhamus and R. R. White of Sumner and C. H. Williams of Puyallup.

Upon organizing the Commission secured the services of Col. A.O. Powell as Engineer, the citizens of Puyallup and Sumner and land owners along the rivers added by contribution \$19,000.00 to the State fund so that the Commission undertook the work with a total budget of but \$69,000.

The owners of land along side the river as well as the general public insisted that the Commission do two particular things, i-e,

No. 1-- That they straighten the river from Sumner to Tacoma, General Chittenden in his report had stated that by cutting thru the bends, several miles of the distance between Sumner and Tacoma would be saved; against this Mr Paulhamus was very definite in his objections claiming that to shorten the distance would increase the rate of grade and greatly increase the scour and that these cuts would create raw banks the full length of the river which would be difficult to hold, to this Col. Powell agreed, but the clamor was so strong that in 1909 he cut a very narrow channel twenty feet in width at the base across two curves, stating that the river would cut it out to a reasonable width in due time.

In 1914 when Professor Roberts took charge of the work under the 1913 Statute, he found the base width of each cut widened from 20 feet to over 1,000 feet, causing a great expense in his effort to reconstruct andrevet the new banks. To this date we do not know that the full expense resulting from these trial cuts have been made

No. 2-- The demand was (to build a drift barrier). The intent of this was that some type of barrier could be built behind which all drift coming down the White River could be collected and stored;

Col Powell refused to build such a barrier giving his reason for rejection, that the cost would far exceed their total appropriation, and that it would simply create a jam that would ultimately breakout, just as had happened November 16, 1906.

The Commission built a number of plank bulkheads to hold the river in its course and prevent dangerous bank erosion. They also cleared the river of snags and drift, which required considerable work.

No aid could be secured from the 1911 Session of the Legislature but the 1913 Session insisted that the two counties bear their own costs and passed the enabling act under which the present work has been performed.

The newly formed Joint Commission called for three items; As follows--

No. 1-- Build a concrete wall across the full length of the old overflow mouth of the White.

No. 2-- Build a drift barrier to catch all drift before it reaches the mouth of the canyon.

No. 3-- Straighten the river as much as possible from Sumner to Tacoma City limits and revet the new channel with concrete.

These matters were at once undertaken by Professor Roberts who had been employed by the Commission to direct the work. Work was at once started on a wall or concrete dam 1600 feet long, 8 feet wide at base, 4 feet wide on top and 14 feet high to be built across the overflow mouth of White River at a cost of \$48,000.00, in full belief that the 1906 flood had scoured to its final depth the channel bed.

The drift barrier was built under the supervision of an experienced engineer formerly from the U.S.E.D., at a cost of \$60,000; the channel straightening and revetting was carried on under high pressure.

To make a footing under the revetment fir trees with butts five or six inches in diameter were laid down with butts hard up against the bank and the tops laid out flat, a heavy cable was run longitudinally over the tops of the branches about 15 feet out, and tied to the branches with heavy galvanized wire. This work was regarded by the public as being as nearly perfect as possible, and the common declaration was :- In one more year we will have the river fixed for-ever.

About Christmas 1917 a flood occurred, and when the viewers went out to see they found about 800 feet of the Auburn Wall or Dam had been undercut some seven feet, and the drift barrier was badly injured, the great concrete pyramids which had been built to hold the heavy wire cable had been undercut so that to reset them, their cost ran up to \$80,000. A great part of the newly constructed revetment had been undercut and was lying out in the bed of the river; however work was renewed, the interested parties believing that the maximum channel scour had now occurred and the reconstruction of revetment was continued energetically.

In 1922 a flood of moderate intensity occurring, resulting in minor damages, it was then announced that the river now was surely fixed for good.

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In 1933-34 a flood occurred which undercut long stretches of revetment, dropping it into the river, several thousand feet in the places where much had failed in 1917 flood.

Those coming on to direct the work of flood control determined to use rock at the base of all revetment, and since 1936 we have continued to use rock only as a material for this purpose.

A few instances will illustrate the persistent scouring of the stream as will be noted in Mr Essig's special report.

METHODS OF BANK STABILIZATION EMPLOYED

During the years since the inception of the Inter County River Improvement numerous methods of bank stabilization have been employed, each with a greater or lesser success.

Each method employed failed or succeeded in its purpose in proportion to its ability to prevent undercutting where the type of revetment employed to cover the slope of the levee met the medium low water stage of the river.

In each instance where materials employed for this purpose were durable, to the extent of preventing erosion, the revetted levees on the river banks remained intact for many years, and where this was not accomplished failure after failure has occurred requiring replacement at great expense.

It was not until the construction of Mud Mountain Dam on White River that one of the primary causes of our difficulty was remedied, that is FLOOD CONTROL. By the control of extreme floods in the White River, the overtopping of the river banks during peak flood periods could be prevented, however the one constant annoying and equally destructive factor remains unchecked, this is the erosive stream action which continues to operate at all stages of stream flow even at the lowest summer stage.

Since the devastating flood of 1933 and 34 no major floods have occurred in this area, however our records clearly indicate a constant lowering of the channel floor thruout a greater portion of the river channel and a corresponding building up of the channel floor at other sections.

This scouring action along the channel margin near the revetted slopes is and has been our chief concern for many years, and if this condition is not corrected it will result in the destruction of the concrete slab revetment which lines the river banks for many miles.

During the initial construction period of the channel rectification, the levees on either side of the river were built of the fine alluvial silt and sand dredged from the newly constructed channel, and consequently these dikes or levees are very unstable and offer no resistance to the erosive stream action, and it was therefore highly imperative that whatever type of bank revetment employed must extend from high flood stage on the levee down to the toe and well out into the channel if complete channel and bank stabilization was to be accomplished.

The use of fir brush as a mattress at the toe of the concrete revetment served over a period of years but since this mattress decayed rapidly its function as a scour preventative was short lived, in fact wherever brush has been used to prevent scour, within a few years its function as such became nil and had to be replaced with a more durable material, likewise timber piling and sheeting used for this purpose were short lived, seldom lasting more than ten or twelve years and after numerous efforts were made to control and prevent this scouring action along the medium low water margin of the river banks by the use of brush, timber and precast concrete blocks it was decided to use quarried rock.

The Inter-County River Improvement organization in cooperation with Pierce County opened a rock quarry in 1938 near Orting, where

an unlimited quantity of columnar basaltic rock was located, this quarry has been in constant operation since that time.

Thus far this rock has proven to be the most successful and economical riprap material for bank stabilization yet employed as it prevents scour due primarily to the rough surface which induces a silting in action rather than scour.

In numerous locations where floods completely destroyed the levees this rock has been used to construct low dikes paralleling the river channel in approximately the same location as the former levee. These rock dikes have served a two-fold purpose in that they tend to prevent the river from meandering over the widened primary flood plane and also to induce the precipitation of silt and sand on the side away from the main channel. Observation indicates that over a period of years some portion of the eroded riparian lands will be recovered.

Another method of scour prevention which has been employed during recent years, is the construction of short rock groins placed along the toe of the revetment slope, these groins were built at intervals of a proximately twenty five feet to thirty feet, extending out into the stream twenty feet or more at an ~~angle~~^a of about thirty degrees to the ~~axis~~ of the channel. This method of scour control tends to ~~cause~~ silt accumulations, however further study and observation will be necessary to determine the proper location, height and length of these groins before they are approved as ^a/final solution to the scour action.

THE PROBLEM OF RIVER BORNE SILT AND GRAVEL MOVEMENT UNSOLVED.

The movement of this silt and gravel is continuous at all stages of channel flow, being greater during flood periods and diminishing as stream velocities diminish but nevertheless constantly in motion .

Probably the most pronounced illustration of this action is in that area of the channel known as the County Line Section. This section has since the inception of this organization been the dumping ground for a major portion of the heavier gravel and sand which has been carried down from the higher rock walled canyons of the river, due to the reduced channel gradient from forty feet to the mile to four feet at this point.

During the past years, efforts have been made to remove this burden of material layed down in the river channel by dredging. Thousands of cubic yards of this material was dredged out of the channel, however within two or three years the channel was again filled to a height above what it was before dredging. This clearly indicates that if overflow during flood periods is to be prevented this material must be removed.

It has been assumed that the operation of Mud Mountain Dam would as a flood control factor eliminate this gravel movement in the river channel below the dam, but observation has proven otherwise. While no major floods have occurred since the construction of the dam, the silting action in the storage basin immediately above the dam is a problem which requires constant attention.

To avoid blocking up the by-pass tunnel intake, it is necessary to keep sluicing this silted material out of the storage basin down thru the tunnel and into the river channel below the dam where it is again carried down stream and dropped in locations herein described. It is obvious from this experience that over a short period of time we may

anticipate a constant movement of this river borne gravel and sand during all stages of stream flow and that is greatly intensified during flood periods.

ANNUAL PLAN OF OPERATION FOR 1945

Necessary Maintenance Outlined by Sections.

1. RESERVATION AND MURPHY SECTIONS- 4.84 miles in length.

Extending from Station 0 plus 00 to 255 plus 17.

The prevailing condition of the river channel thruout these two sections is practically indentical, in that both the right and left banks have been revetted with a concrete slab many years since and for the most part this concrete slab is in a good state of repair, with the exception that at the lower edge where it terminated on the brush mattress at extreme low water stage.

The condition of this decayed and eroded brush mattress has been the subject of much discussion by your engineers for many years, due primarily to the fact that this mattress no longer functions as a preventative to erosion at the toe of the concrete slab, which if not corrected will soon result in total loss and destruction both to the slab and the levee back of it.

This hazardous condition has necessitated the application of quarried rock in the form of short groins and over ^a considerable area a rock blanket to prevent further loss.

During the year 1944 just closed, we have placed a total of 11,868 cubic yards of quarried riprap rock along the right bank toe beginning at the upper terminus of this section, Station 255 plus 17 extending down stream to Station 90 plus 00. In performing this work we found that it would be impossible to make a continuous application of this rock in one year, we therefore selected those points which evidenced the greatest immediate hazard, keeping in mind the continuation of this work during the next year or until the entire area has been

completely and thoroughly blanketed with a heavy application of this rock.

It is estimated that there will be required approximately 10,000 cubic yards of rock to completely ~~revet~~ the right bank toe thruout these two sections at an estimated cost of \$2.55 per cubic yard in place or a total of \$25,500.00.

As previously reported it was decided that to adequately protect the right bank or north levee thruout these two sections, the levee elevation should be increased in height to conform to the elevation of the State Highway occupying the left hand or south levee. This work started at Station 250 plus 00 continued down stream to Station 103 plus 00 placing 41,944 cubic yards of a gravel-clay mixture. The loading, transporting, placing and leveling of this operation was accomplished at an average cost of \$0.615 per cubic yard. To complete the rebuilding or raising of the levee from Station 103 plus 00 to Station 40 plus 00, it is estimated there will be required 16,000 cubic yards of this same material at an average cost of 65¢ per cubic yard requiring an expenditure of \$10,400.00.

The continuation of this work will in all probability be done during the summer months of this year.

Thruout these two sections on the left bank at the toe of the revetted concrete slope between Stations 38 plus 00 and 240 plus 00 a distance of 4,707 lineal feet, an estimated requirement of 2600 cubic yards of quarried rock will be required at \$2.55 per cubic yard in place amounting to \$6,630.00.

A recap estimated requirement of these two sections will therefore be as follows.

12,600 Cubic yards of rock amounting to	\$32,130.00
16,000 " " " levee fill " "	<u>10,400.00</u>

Total..... \$42,530.00

2. PUYALLUP SECTION-- 1.18 miles in length.

Extending from Station 255 plus 17 to Station 317 plus 40.

During the past year we thoroughly revetted the toe of the concrete slab on the right bank beginning at Station 294 plus 00 to Station 255 plus 00, with an application of quarried rock blanket requiring 3,818 cubic yards.

As indicated on the photograph attached hereto this right bank now presents a stable completed revetment.



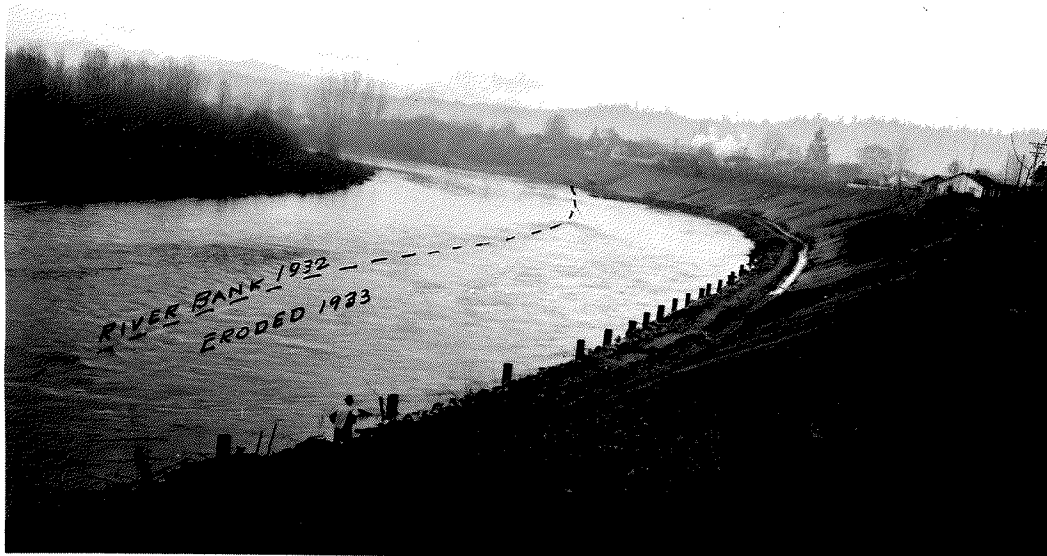
The left bank throughout this section being on the inside periphery of a large curve seldom if ever is subjected to erosive stream action, for the present and until some weakness develops no further revetment maintenance is contemplated on the left bank.

The erosive action of the stream along the right bank throughout this section and the other two sections down stream is such that it appears necessary to construct at some points a series of groins extending streamward from the toe to deflect the force of the current away from these scour pickets. The location and extent of these groins will necessarily be determined by further study and observation.

3. ROESLI SECTION -- 2.10 miles in length.

Extending from Station 317 plus 40 to Station 436 plus 00.

As illustrated on the attached photograph which was taken at Station 332 plus 00 looking upstream, the river at this point makes a very abrupt bend and it is in this area that extensive loss by erosion was sustained during the flood of 1933.



Previous to this flood period the banks of the river had been revetted with a concrete slab and a ballasted brush mattress at the toe of the slab, however the brush mattress had decayed and offered no

in fair condition, some portions of which have been revetted with concrete slab, others are protected with rock groins.

All in all this portion of the channel will for the present require careful observation and should a concentrated erosion occur immediate repair will be made.

4. DIERINGER SECTION -- 3.57 miles in length.

Extending from Station 436 plus 00 to Station 625 plus 00 .

Some portions of the river channel throughout this section have been revetted in past years with either a concrete slab or with a rock blanket, all of which for the present remains in a fair state of repair . Other portions not revetted appears to withstand stream action without serious erosion. Careful observation will be maintained and necessary repair made as occasion demands.

During recent years numerous efforts have been made to secure an automatic stream gaging station on the Stuck River to be located at or near the King-Pierce County line. During past years no definite record of stream discharge has been determined in that portion of the river between the Puget Sound Power & Light Company intake canal above Buckley and the confluence with the Puyallup River below Sumner. In as much as the stream discharges throughout this section of the river is affected by the Power Company's storage basin, it was found advisable to construct a stream gaging station in this vicinity. We have instituted a cooperative agreement with the U. S. Geological Survey to construct an automatic stream gaging station. This station is now under construction and is located on the right bank of the Stuck River at I.C.R.I. Station 622 plus 00 which is approximately three hundred feet down stream from the Stewart Road County Bridge.

5. COUNTY LINE SECTION -- 1.29 miles in length.

Extending from Station 625 plus 00 to Station 693 plus 00 .

This Section of the river channel remains in practically the same condition as it has for the past six or eight years, with one exception, this being the increased amount of gravel and sand which is constantly being dropped by the river as it enters this section where the gradient of the stream flattens out from 40 feet to the mile to 4 feet to the mile forming a natural dumping ground for the river borne material.

This problem of gravel deposit and removal in this section has been discussed elsewhere in this report, and may it suffice to say at this time this section is under observation and a careful study is being made to determine what procedure is to be followed to rectify the difficulties encountered.

6. AUBURN SECTION-- 1.6 miles in length.

Extending from Station 693 plus 00 to Station 780 plus 00 .

As previously reported this section is under constant observation and studies are being made to determine the location and extent of revetment necessary.

Since the flood of 1933-34 little if any material change has occurred in the river channel throughout this section. Our cross section surveys indicate a constant lowering of the channel floor which has continued since the White River diversion that occurred in 1906, and it would be impossible to forecast to what depth this scouring action will lower the channel. This much may be said , that it will be necessary to construct a number of rock groins along the face

of the Auburn Concrete Dam if this structure is to be preserved against loss by erosion.

The best method to pursue is to await the advent of a major flood which will no doubt determine the necessary protection if any that will be required at this point.

Elsewhere throughout this section the river during former years has eroded a wide channel over which the present stream meanders at will doing little if any damage, however this area is being carefully observed and should any concentrated erosion occur which appears hazardous, immediate repairs will be made.

FINANCIAL STATEMENT FOR
INTER-COUNTY RIVER IMPROVEMENT OCTOBER 1944

ITEM	EXPENDITURE PREVIOUS MONTHS	EXPENDITURE OCTOBER	EXPENDITURE TO NOV 1st.
Office	\$ 1,713.31	\$ 182.31	\$ 1,896.24
Engineering	6,446.77	325.00	6,771.77
Placing Rock	9,377.43	372.40	9,749.83
Hauling Rock	24,429.02	465.01	24,894.03
Equipment Maintenance	1,135.79	52.00	1,187.79
Insurance	96.97		96.97
Quarry Operations	9,577.82	823.40	10,401.22
U.S.G.S.	129.14		129.14
Cross Section of Rivers	447.00		447.00
Gas and Oil	225.50	46.50	271.84
Miscl. Labor	84.09	30.00	114.09
Gravel Haul	25,996.13	126.49	26,122.62
Industrial Insurance	218.06	55.00	273.06
Total	\$79,876.87	\$ 2,478.73	\$82,355.60

BUDGET	PIERCE COUNTY	KING COUNTY	TOTAL
1944	\$20,500.00	\$68,100.00	\$88,500.00
Expended to Oct 1st.	<u>16,214.40</u>	<u>63,662.49</u>	<u>79,876.89</u>
Balance Oct. 1st	\$ 4,285.60	\$ 4,437.51	\$ 8,723.11
Expended October 1944	<u>102.25</u>	<u>2,376.46</u>	<u>2,478.71</u>
Balance November 1st.	\$ 4,183.35	\$ 2,061.05	\$ 6,244.40

OCTOBER QUARRY OPERATIONS

INTER COUNTY RIVER IMPROVEMENT

Supervision.....	\$ 150.00
Steel.....	67.85
Misc. supplies.....	7.55
Drillers.....	598.00
Industrial Insurance.....	47.36

Total.....\$ 870.76

Equipment rental..... 150.00

Total cost..... 1,020.76

PUYALLUP RIVER IMPROVEMENT

Clerk.....	\$ 30.00
Supervision.....	235.00
Shovel operator.....	278.40
Watchman.....	135.00
Labor.....	185.00
Misc. supplies.....	5.15
Gasoline.....	36.35
Industrial Insurance.....	30.00

\$ 934.90

Equipment Rental..... 400.00

Total cost.....\$1,334.90

QUARRY COST BALANCE

	PREVIOUS MONTHS	OCTOBER	TO NOV.1st.
INTER COUNTY RIVER IMPROVEMENT	\$11,897.91	\$ 870.76	\$12,768.67
PUYALLUP RIVER IMPROVEMENT	<u>14,039.51</u>	<u>1,334.90</u>	<u>15,374.41</u>
Total	\$25,937.42	\$2,205.42	\$28,143.08

ROCK TAKEN TO NOVEMBER

	PREVIOUS MONTHS	OCTOBER	TO NOV.1st.
INTER COUNTY RIVER IMPROVEMENT	16,120 Cu. Yds.	316 Cu. Yds.	16,436 Cu. Yds.
PUYALLUP RIVER IMPROVEMENT	<u>20,031 " "</u>	<u>1,048 " "</u>	<u>21,079 " "</u>
Total	36,151 Cu Yds.	1,364 Cu Yds.	37,515 Cu.Yds.

FINANCIAL STATEMENT FOR THE
INTER COUNTY RIVER IMPROVEMENT FOR NOVEMBER 1944

ITEM	EXPENDITURES PREVIOUS MONTHS	EXPENDITURE NOVEMBER	EXPENDITURE TO DECEMBER 1st
Office	\$ 1,896.24	\$ 127.05	\$ 2,023.29
Engineering	6,771.77	225.00	6,996.77
Placing Rock	9,749.83	549.50	10,299.33
Hauling Rock	24,894.03	1,747.41	26,641.44
Equipment Maintenance	1,187.79	4.73	1,192.52
Insurance	96.97		96.97
Quarry Operations	10,401.22	627.11	11,028.33
U.S.G.S.	129.14	71.14	200.28
Cross Section of Rivers	447.00		447.00
Gasoline and Oil	271.84		271.84
Misc. Labor	114.09		114.09
Checker on Government Gravel Haul		37.50	37.50
Gravel Haul to River Levee	26,122.62		26,122.62
Industrial Insurance	273.06	40.44	313.50
Total	\$82,355.60	\$ 3,429.88	\$85,785.48

BUDGET	PIERCE COUNTY	KING COUNTY	TOTALING
1944	\$20,500.00	\$68,100.00	\$88,600.00
Expenditure to Nov.1st.	<u>16,316.65</u>	<u>66,038.95</u>	<u>82,355.60</u>
Balance Nov 1st.	\$ 4,183.35	\$ 2,061.05	\$ 6,244.40
Expenditure November	<u>2,409.18</u>	<u>1,020.70</u>	<u>3,429.88</u>
Balance December 1st.	\$ 1,774.17	\$ 1,040.35	\$ 2,814.52

NOVEMBER QUARRY OPERATION

INTER COUNTY RIVER IMPROVEMENT

Supervision.....	\$ 200.00
Powder.....	29.02
Misc. Supplies.....	2.09
Drillers.....	361.00
Clerk.....	35.00
Industrial Insurance.....	20.00

Total.....\$ 647.11

Equipment Rental..... 150.00

Total.....\$ 797.11

PUYALLUP RIVER IMPROVEMENT

Clerk.....	\$ 30.00
Supervision.....	125.00
Shovel Operator.....	449.60
Watchman.....	135.00
Labor.....	100.00
Gasoline.....	372.00
Industrial Insurance.....	46.29

Total.....\$ 1,257.89

Equipment Rental..... 400.00

Total.....\$ 1,657.89

QUARRY COST BALANCE

	PREVIOUS MONTHS	NOVEMBER	TO DEC. 1st.
INTER COUNTY RIVER IMPROVEMENT	\$12,768.67	\$ 797.11	\$13,565.78
PUYALLUP RIVER IMPROVEMENT	<u>15,374.41</u>	<u>1,657.89</u>	<u>17,022.30</u>
Total	\$28,143.08	\$2,455.00	\$30,588.08

ROCK TAKEN TO DECEMBER 1944

	PREVIOUS MONTHS	NOVEMBER	TO DEC. 1st.
INTER COUNTY RIVER IMPROVEMENT	16,436 C.Y.	1,268 C.Y.	17,704 C.Y.
PUYALLUP RIVER IMPROVEMENT	<u>21,079 C.Y.</u>	<u>3,180 C.Y.</u>	<u>24,259 C.Y.</u>
Total	37,515 C.Y.	4,448 C.Y.	41,963 C.Y.
Pierce Co Rd Dist 1.	<u>117 C.Y.</u>	<u>210 C.Y.</u>	<u>138 C.Y.</u>
Total Rock Quarried	37,632 C.Y.	4,457 C.Y.	42,089 C.Y.

DECEMBER QUARRY COST

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OPERATIONS

INTER COUNTY RIVER IMPROVEMENT
Supervision.....\$ 150.00

PUYALLUP RIVER IMPROVEMENT
Supervision.....\$ 117.50
Shovel Operator..... 450.80
Drillers..... 260.40
Watchman..... 135.00
Labor, (checker)..... 168.00
Powder..... 25.24
Gasoline..... 268.85
Industrial Insurance..... 58.58

Total.....\$ 150.00

Total.....\$ 1,483.87

Equipment Rental..... 150.00

Equipment Rental..... 400.00

Total.....\$ 300.00

Total.....\$ 1,883.87

QUARRY COST BALANCE

	PREVIOUS MONTHS	DECEMBER	TO DECEMBER 31st.
INTER COUNTY RIVER IMPROVEMENT	\$13,565.78	\$ 300.00	\$13,865.78
PUYALLUP RIVER IMPROVEMENT	<u>17,022.30</u>	<u>1,883.87</u>	<u>18,906.17</u>
Total	\$30,588.08	\$2,183.87	\$32,771.95

ROCK TAKEN TO DECEMBER 31st, 1944

	PREVIOUS MONTHS	DECEMBER	TO DECEMBER 31st.
INTER COUNTY RIVER IMPROVEMENT	17,704 c. y.	540 C.Y.	18,247 C.Y.
PUYALLUP RIVER IMPROVEMENT	<u>24,259 C.Y.</u>	<u>2,664 C.Y.</u>	<u>26,923 C.Y.</u>
Total	41,963 C.Y.	3,204 C.Y.	45,170 C.Y.
Pierce County Rd Dist 1.	<u>138 C.Y.</u>		<u>138 C.Y.</u>
Total rock quarried	42,101 C.Y.	3,204 C.Y.	45,308 C.Y.

QUARRY
COST AND PRODUCTION FOR YEAR
1944

ITEM	PUYALLUP RIVER IMPROVEMENT	INTER-COUNTY RIVER IMPROVEMENT	TOTAL
Clerk	\$ 390.00		\$ 390.00
Supervision	1,632.27	\$ 1,500.00	3,132.27
Drill Steel		680.84	680.84
Powder and Caps	466.17	1,533.61	1,999.78
Misc. supplies	198.64	77.67	276.31
Gasoline and Oil	2,110.01		2,110.01
Industrial Insurance	200.54	105.12	305.66
Drillers (labor)	3,267.55	5,467.14	8,734.69
Shovel Operators	3,211.70	2,619.55	5,831.25
Watchman	1,680.89		1,680.89
Labor (checker)	1,668.40	204.41	1,872.81
Labor (other)		27.44	27.44
Total	\$14,826.17	\$12,215.78	\$27,041.95
Equipment Rental Shovel	4,080.00		4,080.00
Equipment Rental Compressor & Drilling Equip.		1,650.00	1,650.00
Total Quarry Cost	\$18,906.17	\$13,865.78	\$32,771.95

TOTAL ROCK DELIVERED to:

	PUYALLUP RIVER IMPROVEMENT	INTER-COUNTY RIVER IMPROVEMENT	TOTAL
Rock taken during 1944	26,923 cubic yards	18,247 cubic yards	45,170 cubicyards
Pierce County Road Dist. #1			138 " "
Total			45,306 Cubic yards
Average cost per cubic yard to quarry and load.....\$0.723			

EQUIPMENT MAINTENANCE COST FOR 1944

	PUYALLUP RIVER IMPROVEMENT	INTER-COUNTY RIVER IMPROVEMENT	TOTAL
Shovel (Koehring)	\$1,406.17		\$1,406.17
Air Compressor #1		\$ 117.37	117.37
Air Compressor #2		32.65	32.65
Drilling Equipment		635.26	635.26
Total	\$1,406.17	\$ 785.28	\$2,191.45

FINANCIAL STATEMENT FOR
INTER COUNTY RIVER IMPROVEMENT FOR DECEMBER 1944

ITEM	EXPENDITURES PREVIOUS MONTHS	EXPENDITURES DECEMBER	EXPENDITURES TO DECEMBER 31st.
Office	\$ 2,023.29	\$ 249.71	\$ 2,273.00
Engineering	6,996.77	500.60	7,497.37
Placing Rock	10,299.33	167.40	10,466.73
Hauling Rock	26,641.44	801.36	27,442.80
Equipment Maintenance	1,192.52	216.47	1,408.99
Insurance	96.97		96.97
Quarry Operation	11,028.33		11,028.33
U.S.G.S.	200.28	224.60	424.88
Cross Section of Rivers	447.00		447.00
Gas and Oil	271.84	79.92	351.76
Misc. Labor	114.09		114.09
* Checker on Army Gravel Haul	37.50	100.00	137.50
Gravel Haul to River Levee	26,122.62		26,122.62
Industrial Insurance	313.50	21.74	335.24
Total	\$35,785.48	\$2,361.80	\$38,147.28

BUDGET	PIERCE COUNTY	KING COUNTY	TOTAL
1944	\$20,500.00	\$68,100.00	\$88,600.00
Expenditures to Dec.1st,	<u>18,725.83</u>	<u>67,059.65</u>	<u>85,785.48</u>
Balance December 1st.	\$ 1,774.17	\$ 1,040.35	\$ 2,814.52
Expended December	<u>1,434.06</u>	<u>927.74</u>	<u>2,361.80</u>
Balance Dec. 31st.	\$ 340.11	\$ 112.61	\$ 452.72

* This item is salary of checker whom is recording cubic yards of gravel taken from Inter County River Improvement stock pile at Dieringer and sold to the Auburn Holding & Reconsignment Point. Auburn, Wash.